

# 98 Family Histories



**F**ossils have been found in Precambrian rocks 3.5 billion years old. But most have been found in rocks of the Paleozoic, Mesozoic, and Cenozoic eras, which are all less than 550 million years old. The types of organisms found in different rocks can provide important information about the history of life on Earth. The term **fossil record** refers to all of the fossils that have been found on Earth.

The fossil record has been used to classify fossils into families. A family is a category smaller than a kingdom, phylum, class, or order, but larger than a genus or species. For example, dogs are in the family Canidae, which also contains foxes, jackals, coyotes, and wolves. Lions are in the same kingdom, phylum, class, and order as dogs, but they are in a different family: Felidae. This family includes leopards, tigers, cheetahs, house cats, and extinct species such as the saber-toothed cat. You will investigate how the numbers of families in the fish, mammal, and reptile classes have changed over geological time.

**CHALLENGE** → What can you learn about evolution by comparing the fossil records of fish, mammals, and reptiles?

## MATERIALS



For each student

- 1 Student Sheet 98.1, "Graphs of Fossil Families"
- 1 set of colored pencils (optional)

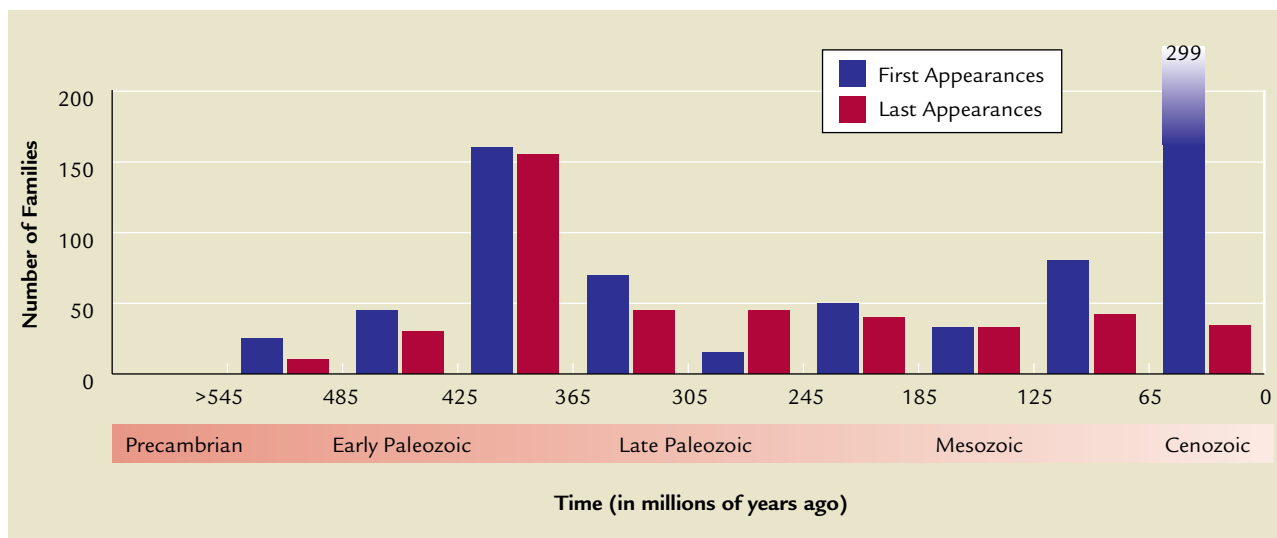
Classifying Carnivores			
Classification Level	Dogs		Lions
Kingdom	Animalia		Animalia
Phylum	Chordata		Chordata
Class	Mammalia		Mammalia
Order	Carnivora		Carnivora
Family	<b>Canidae</b>		<b>Felidae</b>
Genus	<i>Canis</i>		<i>Panthera</i>
Species	<i>familiaris</i>		<i>leo</i>



## PROCEDURE

- Table 1 below provides the history of all the families of fish currently known from the fossil record. When a fossil is found that does not belong to any family found in *earlier* geologic time periods, we call it a “first appearance.” It is the first appearance of that family in the fossil record. When a fossil is found that does not belong to any family found in *later* geologic time periods, we call it a “last appearance.” It is the last appearance of that family in the fossil record. Look at Table 1 and discuss the following questions with your partner:
  - Between which years did the greatest number of fish families appear in the fossil record? In what era was this period of time?
  - Between which years did the greatest number of fish families disappear from the fossil record? In what era was this period of time?

Table 1: History of Fossil Fish Families										
Era	Precambrian	Early Paleozoic			Late Paleozoic		Mesozoic			Cenozoic
Time (mya)	>545	485	425	365	305	245	185	125	65	0
Number of first appearances	0	25	43	162	67	13	52	33	84	299
Number of last appearances	0	9	31	158	49	48	36	20	44	34



- The double bar graph on the previous page is based on the data shown in Table 1. Look at the graph and discuss with your partner in what ways the graph makes the data easier to interpret.
- Use the information in Table 2 to make a double bar graph for families of reptiles, similar to the one for fish shown on the previous page. Since you will be comparing graphs, be sure to use the same scale on the y-axis.

**Table 2: History of Fossil Reptile Families**

Era	Precambrian	Early Paleozoic			Late Paleozoic		Mesozoic			Cenozoic
Time (mya)	>545	485	425	365	305	245	185	125	65	0
Number of first appearances	0	0	0	0	3	67	95	68	97	35
Number of last appearances	0	0	0	0	1	57	93	46	84	26

**Table 3 : History of Fossil Mammal Families**

Era	Precambrian	Early Paleozoic			Late Paleozoic		Mesozoic			Cenozoic
Time (mya)	>545	485	425	365	305	245	185	125	65	0
Number of first appearances	0	0	0	0	0	0	6	14	33	404
Number of last appearances	0	0	0	0	0	0	2	8	33	262

- Use the information in Table 3 to make a double bar graph for families of mammals, similar to the one for fish shown on the previous page. Since you will be comparing graphs, be sure to use the same scale on the y-axis.



*A familiar example of a fossilized reptile*

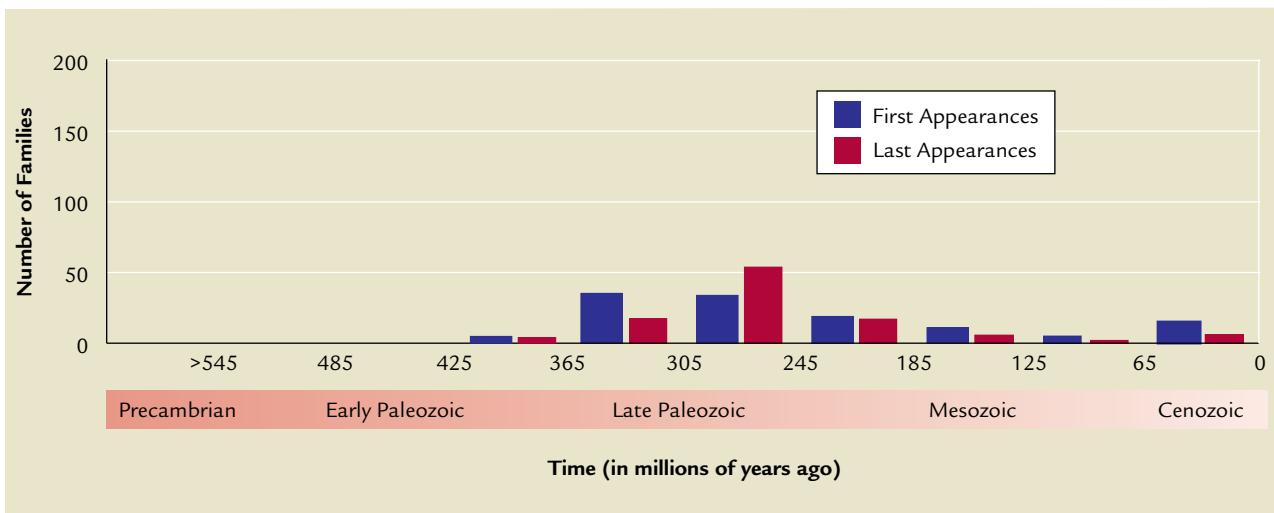
## ANALYSIS



1.
  - a. Use the graphs to place the three different classes in order, based on when they first appeared in the fossil record.
  - b. What could this order tell you about the evolution of these types of species?
2.
  - a. What are some possible explanations for the disappearance of a family from the fossil record?
  - b. How could Darwin's theory of natural selection explain the disappearance of these families?
3. What could explain the appearance of a family in the fossil record?

Table 4: History of Fossil Amphibian Families

Era	Precambrian	Early Paleozoic			Late Paleozoic		Mesozoic			Cenozoic
Time (mya)	>545	485	425	365	305	245	185	125	65	0
Number of first appearances	0	0	0	3	35	33	19	11	5	15
Number of last appearances	0	0	0	3	16	53	18	5	1	5



4. Look at your answer for Analysis Question 1. Where do you think scientists have placed the amphibian family?
5.
  - a. The Cenozoic Era is often referred to as the “Age of Mammals.” Using evidence from this activity, explain why.
  - b. Based on evidence from this activity, what could you call the Mesozoic Era? Explain your reasoning.
  - c. Look at the appearances and disappearances of families over time on all three graphs. Why is it misleading to label an era as the “age of” any particular class?
6. **Reflection:** Do you think the evolution of animals from aquatic fish to land mammals was inevitable?